

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MISSOURI
EASTERN DIVISION

A.O.A., <i>et al.</i> ,)	
)	Case No. 4:11-cv-00044-CDP
Plaintiffs,)	(CONSOLIDATED)
)	
vs.)	
)	
THE DOE RUN RESOURCES)	
CORPORATION, <i>et al.</i> ,)	
)	
Defendants.)	

**DEFENDANTS' MEMORANDUM OF LAW IN SUPPORT OF MOTION
TO EXCLUDE THE PROFFERED OPINION TESTIMONY OF PLAINTIFFS'
EXPERT WITNESS DAVID SULLIVAN UNDER RULE 702 AND *DAUBERT***

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I. INTRODUCTION

Plaintiffs allege personal injuries resulting from stack and fugitive air emissions from the La Oroya Metallurgical Complex (“Complex”) in the Andes Mountains of Peru. To support those claims, Plaintiffs proffer the expert testimony of David Sullivan, a meteorologist and air quality modeler. Mr. Sullivan intends to offer opinions at trial on two fundamental issues. *First*, Mr. Sullivan has prepared a reconstructed air emission inventory purporting to detail stack and fugitive air emissions from the Complex for certain years during Doe Run Peru’s (“DRP”) ownership. (Mr. Sullivan made no effort to estimate air emissions before DRP acquired the Complex even though it is undisputed that during those 75 years the Complex emitted significant amounts of lead and other substances that settled in and around areas where Plaintiffs lived and attended school.) *Second*, using his reconstructed air emission inventory, Mr. Sullivan performed computer modeling intended to estimate air quality concentrations at locations surrounding the Complex. (See Ex. A, Expert Report of David Sullivan (“Initial Sullivan Report”) 2/17/2019; Ex. B., Rebuttal Expert Report of David Sullivan (“Rebuttal Sullivan Report”) 6/22/2020; Ex. C, Additional Expert Report of David Sullivan (“Additional Sullivan Report”) 12/1/2020; Ex. D, Supplemental Expert Report of David Sullivan (“Supplemental Sullivan Report”) 5/28/2021.)

Mr. Sullivan’s opinions regarding his air emissions inventory and his related air quality modeling are riddled with significant errors that render his opinion testimony irrelevant and unreliable. As this motion cannot begin to recount Mr. Sullivan’s multitude of mistakes, it instead focuses on two fundamental defects that render the primary foundations of his testimony inadmissible. For starters, Mr. Sullivan grossly exaggerates fugitive air emissions from the Complex such that his estimates bear no reasonable relation to reality. He does this by first assuming that the fugitive air emission estimates that DRP prepared during its ownership included only small particles (referred to as PM₁₀, meaning particles 10 microns in size and smaller) and

omitted all larger particles. Mr. Sullivan then concludes that the vast majority of fugitive air emissions from the smelter would have been **larger** than 10 microns. And to account for these supposedly missing particles, Mr. Sullivan massively ramps up his estimated fugitive air emissions, artificially increasing his overall estimated fugitive lead rates by more than a factor of 6 (and for some sources by as much as a factor of 12). This methodology is not only speculative and unsubstantiated, but directly contradicts that described in his primary reliance source, a study conducted on behalf of the U.S. Environmental Protection Agency (“EPA”) in the 1970s, which establishes conclusively that the vast majority of fugitive air emissions from these sources are in fact **smaller** than 10 microns in size. (Ex. E, *Sample Fugitive Lead Emissions from Two Primary Lead Smelters*, Oct. 1977 (“*Two Lead Smelters Study*”).) The result of this error is that Mr. Sullivan’s purported air emissions depict conditions that never existed during DRP’s operations.

Compounding this error, Mr. Sullivan’s modeling of ambient air concentrations—which in many cases expressly incorporate his grossly inflated air emissions inventory—fails to satisfy the minimum criteria for reliability upon which Mr. Sullivan himself depends. Mr. Sullivan maintains that modeling results are sufficiently accurate even when they overestimate or underestimate actual measured air concentrations by a factor of two. But, even by this forgiving standard, Mr. Sullivan’s air quality modeling results are so different from actual measurements taken from air monitoring stations in areas surrounding the Complex that they are indisputably unreliable and inadmissible.

This is not the first time Mr. Sullivan has proffered testimony so unreliable and unhelpful that it must be excluded. Thus, consistent with the decisions of other courts that have reviewed and excluded Mr. Sullivan’s work, Defendants respectfully request that the Court preclude Mr. Sullivan from testifying on these two primary topics at trial and exclude any other evidence and testimony that relies on Mr. Sullivan’s irrelevant and unreliable testimony.

II. LEGAL STANDARD

Under *Daubert v. Merrell Dow Pharmaceuticals, Inc.* and Federal Rule of Evidence 702, a federal district court has a duty to act as a gatekeeper, ensuring that only scientifically reliable and relevant expert evidence is presented to the jury. *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 589 (1993). Pursuant to Rule 702, a qualified expert witness may testify in the form of an opinion, provided:

- (a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.

This gatekeeping function serves “to make certain that an expert, whether basing testimony upon professional studies or personal experience, employs in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field.” *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 152 (1999). “The proponent of the expert testimony must prove its admissibility by a preponderance of the evidence.” *Redd v. DePuy Orthopaedics, Inc.*, 700 F. App’x 551, 554 (8th Cir. 2017). Courts should exclude opinions that are not sufficiently relevant or scientifically reliable according to the standards set out in *Daubert* and Rule 702.

“To show that the expert testimony is relevant, the proponent must show that the reasoning or methodology in question is applied properly to the facts in issue.” *Marmo v. Tyson Fresh Meats, Inc.*, 457 F.3d 748, 758 (8th Cir. 2006); *see also Daubert*, 509 U.S. at 591–92 (“Rule 702’s ‘helpfulness’ standard requires a valid scientific connection to the pertinent inquiry as a precondition to admissibility.”); *Lauzon v. Senco Prods., Inc.*, 270 F.3d 681, 687 (8th Cir. 2001) (court must consider “whether the proposed expert sufficiently connected the proposed testimony

with the facts of the case”). To satisfy the reliability requirement, the party offering the expert testimony must show by a preponderance of the evidence that the methodology underlying his or her conclusions is scientifically valid. *Barrett v. Rhodia, Inc.*, 606 F.3d 975, 980 (8th Cir. 2010). “Failure to show the reliability of each step in an expert’s methodology is fatal under *Daubert*.” *In re Baycol Prod. Litig.*, 532 F. Supp. 2d 1029, 1042 (D. Minn. 2007). “[A]ny step that renders the analysis unreliable . . . renders the expert’s testimony inadmissible.” *Amorgianos v. Nat’l R.R. Passenger Corp.*, 303 F.3d 256, 267 (2d Cir. 2002) (citation omitted and emphasis removed). Moreover, “[e]xpert testimony that is speculative is not competent proof and contributes nothing to a legally sufficient evidentiary basis.” *J.B. Hunt Transp., Inc. v. Gen. Motors Corp.*, 243 F.3d 441, 444 (8th Cir. 2001) (citation omitted).

III. PLAINTIFFS HAVE NOT MET THEIR BURDEN UNDER *DAUBERT* AND RULE 702 TO SHOW THAT MR. SULLIVAN’S TESTIMONY IS RELIABLE AND RELEVANT TO THE FACTS OF THIS CASE

A. Mr. Sullivan’s Reconstructed Air Emission Inventory Radically Overestimates Fugitive Emissions

Mr. Sullivan’s central opinions in this case are tied to and dependent upon his reconstructed inventory of air emissions from the Complex during DRP’s ownership period.¹ This reconstructed inventory consists of estimates of both *stack* emissions and *fugitive* emissions. Stack emissions are those that are released into the air from a stack, chimney, or comparable source, typically after passing through a pollution control device such as a baghouse. Fugitive emissions, in contrast, are air emissions that escape from a source or process without first passing through a stack or chimney.

¹ Plaintiffs’ initial air emissions inventory for the Complex was prepared by Dr. Nicholas Cheremisinoff in 2019. When Dr. Cheremisinoff passed away in August 2020, Mr. Sullivan took over responsibility for that inventory. Mr. Sullivan largely adopted Dr. Cheremisinoff’s work while making some relatively minor revisions as to both stack and fugitive air emissions. (Ex. C, Additional Sullivan Report 12/1/2020 at 8.)

(Ex. F, Ministry of Energy and Mines, Report No. 118-2006-MEM (RENCOGRP-001910) 5/25/2006, at RENCOGRP-001915 n.4.)) By their nature, stack emissions are easier to quantify. When it owned the Complex, DRP quantified stack emissions through regular stack testing, resulting in readily available data recognized by both parties. Thus, it is the fugitive component of Mr. Sullivan's reconstructed air emission inventory that is at issue here, specifically as to fugitive emissions of lead, arsenic, and other particulates.²

Mr. Sullivan's analysis of fugitive emissions begins with a series of tables DRP prepared³ estimating those emissions as of 2002 as well as expected fugitive emission reductions in subsequent years following DRP's planned completion of various environmental control and modernization projects. DRP prepared these estimates to ensure that the planned projects would be sufficient to bring the Complex into compliance with Peruvian air quality standards within the time allotted by the Government of Peru in the PAMA.⁴ To prepare these estimates, DRP used what is called a "mass balance approach" informed by engineering judgment and experience at other smelters. (Ex. G, DRP, Feb. 17, 2004 Request to Modify the PAMA, RENCOGRP-002468, at RENCOGRP-002470 ("[A] bulk estimate [of fugitive emissions] has been developed through

² While Defendants have a number of objections to and criticisms of Mr. Sullivan's estimates of fugitive SO₂ emissions, this motion focuses on fugitive emissions of particulates rather than gases.

³ Dan Vornberg, the Vice President of Environmental Affairs at Doe Run Resources at the time, worked with others at DRP to help prepare these stack and fugitive emission inventories. As a result, various expert reports and depositions sometimes refer to the "Vornberg memos" or the "Vornberg estimates."

⁴ Peru established its first environmental regulations in the early- to mid-1990s. As part of this process, Peruvian law required operating facilities to develop and submit for governmental approval an "Environmental Adjustment and Management Program" (or "PAMA" for its acronym in Spanish). The PAMA for the Complex, which was approved by Peru prior to Doe Run Peru's acquisition, gave the facility 10 years to implement specified environmental and emission control projects intended to ensure compliance with Peru's environmental requirements, or "maximum permissible levels." (Ex. F, Report No. 118-2006-MEM at RENCOGRP-001913.)

analysis processes of data on the chimney emissions and engineering estimates based on the metallurgical balances.”); Ex. H, McVehil-Monnet Associates, *Air Quality Dispersion Modeling for Human Health Risk Assessment*, Sept. 6, 2005, DRRCE-00754308, at DRRCE-00754317 (“Estimates of fugitive emissions have been provided by Doe Run based on material balances and experience at other smelters where emissions have been quantified.”).)

The mass balance method, sometimes referred to as a “material balance,” is centered on the idea that what goes in, must come out. This method thus looks to: (1) identify the total amount of a substance brought into a manufacturing or refining process; (2) determine the amount of that substance contained in finished product; and (3) account for losses along the way, whether through air emissions, wastewater releases, disposal at a landfill, or otherwise. Mr. Sullivan acknowledges that DRP’s tables using this mass balance method constitute the “best available data” of fugitive emissions from the Complex. (Ex. C, Additional Sullivan Report 12/1/2020 at 28.)

DRP first used the mass balance methodology to prepare fugitive emission estimates for lead and arsenic. (Ex. G, Feb. 17, 2004 Request to Modify the PAMA, at RENCOGRP-002471.) In February 2004, DRP submitted those estimates to Peru’s Ministry of Energy and Mines (“MEM”) as part of a request to amend the PAMA to prioritize work on projects designed to reduce fugitive emissions. As described in this submission, DRP’s lead and arsenic estimates reflected “**Total** Fugitive [Emissions].” (*Id.* (emphasis added; brackets in original).)⁵ These estimates thus

⁵ Beyond the unambiguous description of the fugitive estimates as “Total,” DRP’s 2004 request expressly states that, as a conservative measure, it did not exclude any lead based on particle size. DRP’s submission notes that, in Peru, the applicable regulatory air quality standard “is a monthly average of taken PM₁₀, whereas in the United States the standard is the quarterly average of a sample of lead taken from the total amount of particles in suspension.” (Ex. G at RENCOGRP-002470.) In calculating the lead emission reductions needed to bring the Complex into compliance with the Peruvian standard, DRP did not adjust its formula to target PM₁₀ only, but instead focused on the “**total volume of emissions**,” which “consider[ed] that **100%** of fugitive emissions affect air quality (a conservative approach)” (*Id.* at RENCOGRP-002472 (emphasis added).)

included all fugitive emissions from the Complex and did not exclude any emissions of lead and arsenic, including those in particulates larger than 10 microns.⁶

Contrary to this express description, Mr. Sullivan assumes that DRP's lead and arsenic estimates do not represent total fugitive emissions but instead reflect only the fraction of emissions contained in small particulates or PM₁₀. While this assumption by Mr. Sullivan is plainly wrong, the present motion does not turn on that error. Rather, Mr. Sullivan's far more egregious mistake was assuming that the overwhelming majority—in some cases more than 90%—of fugitive lead and arsenic emissions from the Complex were contained in large particles purportedly not accounted for in DRP's estimates. In point of fact, precisely the opposite is true, as the key study relied upon by Mr. Sullivan conclusively establishes. This foundational mistake led Mr. Sullivan to inflate DRP's estimated fugitive emissions drastically to try and compensate for DRP's supposed omission; Mr. Sullivan accomplished that ramp up by *multiplying DRP's fugitive estimates by more than a factor of 6 overall and for one source by nearly a factor of 12*. Mr. Sullivan's inflated figures lack a reliable scientific basis and bear no reasonable relation to conditions at the Complex and accordingly should be excluded.

1. Mr. Sullivan's Technical Basis for Ramping Up the Complex's Estimated Fugitive Air Lead Emissions Has No Scientific Validity

To understand the source of Mr. Sullivan's mistake, it is necessary to examine closely the primary technical authority on which he relies. This authority, cited throughout Mr. Sullivan's

⁶ In 2006, two years after preparation of the lead and arsenic estimates, Mr. Vornberg helped generate fugitive emission estimates for other metals as well as particulates. (Ex. I at DRRCE-00922042–056.) While Mr. Sullivan likes to point out that the memo for particulates is titled “Table of PM₁₀ Dust Emissions,” he ignores the fact that Mr. Vornberg's handwritten notes and metal-to-dust ratios specify that he is addressing “polvo total,” meaning “total dust,” which includes all particulates. (*Compare id.* at DRRCE-00922042, *with id.* at DRRCE-00922044.) Mr. Sullivan likewise ignores the references to “total” fugitive emissions of lead and arsenic in DRP's earlier request to MEM in 2004.

reports as “Reference 115,” is the “*Two Lead Smelters Study*” published by EPA in 1977. (See, e.g., Ex. C, Sullivan Additional Report 12/1/2020, Table 2-40 at 92; Ex. D, Supplemental Sullivan Report 5/28/2021 at 100.)

Mr. Sullivan’s interpretation of EPA’s Two Lead Smelters Study—and his conclusion that almost all lead emitted from a smelter is larger than 10 microns— is contradicted by EPA itself, which has reviewed its own Two Lead Smelters Study and other related studies and reached the exact opposite conclusion. These findings are summarized by EPA in a publication known as “AP-42,” which Mr. Sullivan acknowledges is widely regarded as authoritative on these questions. According to EPA:

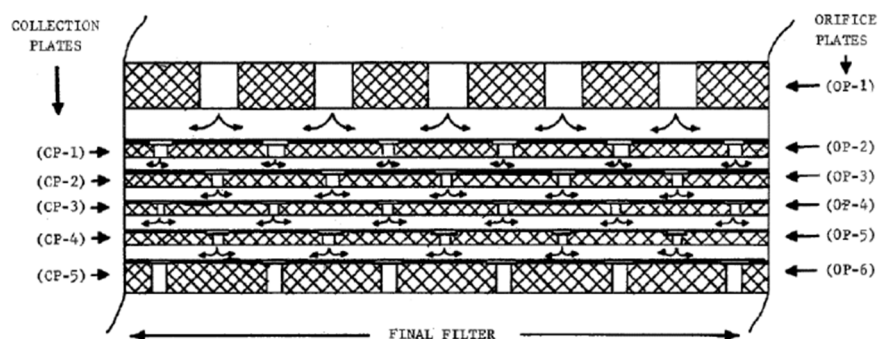
The size distribution of fugitive emissions at a primary lead processing plant is fairly uniform, ***with approximately 79 percent of these emissions at less than 2.5 micrometers.***

(Ex. J, U.S. EPA, AP-42: Air Emissions Factors (4th Ed. 1985), Chpt. 7.6 *Primary Lead Smelting*, at 7.6-6 (emphasis added).) In other words, contrary to Mr. Sullivan’s assumptions, the vast majority of particulates in lead smelter fugitive emissions are not just smaller ***but far smaller than 10 microns***, and even smaller than 2.5 microns.

2. Mr. Sullivan Wholly Disregards the Central Findings on Particle Size Distribution Contained in the *Two Lead Smelters Study*

An examination of the findings in the *Two Lead Smelters Study* confirms EPA’s conclusion. In this study, scientists examined the particle size distribution of fugitive air emissions from primary lead smelters located in Glover, Missouri, and East Helena, Montana in the 1970s. At both smelters, this work was accomplished primarily using a “Sierra, Model 230, HiVol cascade impactor,” which is designed to capture different particle size ranges at different stages. (Ex. E, *Two Lead Smelters Study* at pdf pp. 28, 37.) As the name suggests, a cascade impactor is comprised of a series of filter stages where particulates are collected followed in the end by a backup filter.

The testing device works by drawing air through progressively smaller and smaller slots past a series of turns. Particles that are too large to follow the change in air direction collide with and are captured by the filter at that stage, while smaller particles remain in the air stream and travel to the next stage. This process results in the collection of smaller and smaller particulates at each successive stage. After the last filter stage, the smallest remaining particulates are collected on the backup filter, thus accounting for all particulates contained in the airstream. Following collection, all stage filters plus the backup filter are weighed with results reported in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Figure 7-1 from the Supplemental Expert Report of Defense expert Dr. Shari Libicki, reproduced below, provides a cross-sectional view of this type of cascade impactor:



(Ex. K, Supplemental Expert Report of Dr. Shari Libicki (“Supplemental Libicki Report”) 03/19/2021 at 24.).

In this process, the smallest particulates wind their way through all of the stages and are captured on the backup filter. Slightly larger particulates are captured at the Stage 5 filter, still larger particles are caught at the Stage 4 filter, continuing to the Stage 1 filter where the largest of all particulates are captured. Through this use of a cascade impactor, the scientists in the *Two Lead Smelters Study* were thus able to (1) determine the total amount of lead and other particulates emitted from various fugitive emission sources at the two smelters (by adding up all particulates

captured on all filters), and (2) provide a detailed breakdown of particle size distribution—meaning the percentage of the total mass of particulates found in the different size ranges—for those fugitive emission sources. (Ex. E, *Two Lead Smelters Study* at pdf pp. 28–29, 38.)

The results of this collection of particulate data at the six different filter stages for the Glover smelter are shown in Table 11 of the study, which is excerpted below:

LEAD CONTENT BY PARTICLE-SIZE RANGE: GLOVER, MISSOURI, PLANT				
Location	Concentration ($\mu\text{g}/\text{m}^3$)		Ratio (Lead/T.P.)	Particle- Size Range ^{b/} (μ)
	T.P. ^{a/}	Lead		
Sinter building	1,420	826	0.581	< 0.38
	207	120	0.580	0.38–0.71
	174	101	0.580	0.71–1.15
	112	65.1	0.581	1.15–2.3
	117	68.1	0.582	2.3–5.6
	116	67.5	0.581	> 5.6
Blast furnace (tapping operations)	44.1	27.5	0.625	< 0.31
	39	16.6	0.425	0.31–0.59
	32.7	15.0	0.459	0.59–0.95
	24.7	12.5	0.506	0.95–1.9
	40.4	22.5	0.557	1.9–4.6
	75.7	45	0.594	> 4.6
Blast furnace (charge-feed area)	1,301	897	0.689	< 0.33
	79.1	42.9	0.542	0.33–0.63
	82.1	40.7	0.496	0.63–1.0
	81.2	48.3	0.595	1.0–2.03
	190	107	0.563	2.03–4.9
	338	182	0.538	> 4.9
Ore-storage-bin area	372	80	0.215	< 0.31
	36.6	7.89	0.215	0.31–0.59
	54.4	11.7	0.215	0.59–0.95
	45.1	9.71	0.215	0.95–1.9
	89.5	19.3	0.216	1.9–4.6
	177	38	0.215	> 4.6

a/ T.P. = total particulate.
b/ Aerodynamic particle size (Sierra 5-stage impactor was used in HiVol samples).

(*Id.* at pdf p. 30.) As reflected in this table, total particulate concentrations (designated “T.P.” in the second column) taken for each sample location as determined by weight ($\mu\text{g}/\text{m}^3$) are provided for each of the six successive filter stages. By way of example, for the first source—the “[s]inter building”—the table lists the concentration of total particulates collected at each of the six filter stages. The results are listed beginning with the smallest particulate size—1,420 $\mu\text{g}/\text{m}^3$ captured on the backup filter—and increasing through the various stages to the largest size—116 $\mu\text{g}/\text{m}^3$ as

contained in the Stage 1 filter. The size ranges for the successive filter stages are specified in the last column titled “Particle Size Range,” which reflects particulate size in microns. For the sinter building, the backup filter contains particulates smaller than 0.38 microns, followed by Stage 5 at 0.38 to 0.71 microns; Stage 4 at 0.71 to 1.15 microns; Stage 3 at 1.15 to 2.3 microns; Stage 2 at 2.3 to 5.6 microns; and finally Stage 1 with particulates larger than 5.6 microns. At the sinter building, the concentration of total particulates for all filter stages when added together is 2,146 $\mu\text{g}/\text{m}^3$, of which only 116 $\mu\text{g}/\text{m}^3$ —just 5.4%—is contained in particles larger than 5.6 microns. This data directly contradicts Mr. Sullivan’s belief that most fugitive lead and other particulate emissions from lead smelters are larger than 10 microns or PM_{10} .

To present the results from Table 11 in more readily digestible form, Dr. Libicki in her Supplemental Report takes the data contained in table and provides the particle size distribution not only by weight but also by percentage of the total at all four locations at the Glover facility. Results at these locations demonstrate—directly contrary to Mr. Sullivan’s belief—that *the vast majority of fugitive air emissions are not just smaller but far smaller than 10 microns*. (Ex. K, Supplemental Libicki Report 3/19/2021, Table 7-1 at 26.) In fact, as detailed by Dr. Libicki, particulates *smaller than 5 microns* make up between *70.5% to 94.6%* of fugitive particulate emissions from these sources. (*Id.*)

The results for the East Helena smelter are similar to those of Glover. The study’s authors again used the same type of cascade impactor to evaluate the particle-size distribution of total fugitive emissions at several locations. (Ex. E, *Two Lead Smelters Study* at pdf p. 32–34.) While the full particle size distribution data is contained in the study’s appendices (*id.* at pdf pp. 107–13), the text of the study provides a table of results only for the blast furnace roof opening, as shown in Figure 4 excerpted below:

Concentration ^{1/} in $\mu\text{g}/\text{m}^3$		Ratio Lead/T P	Particle Size Range in Microns
Total Particulate	Lead		
652.0	30.8	0.047	<0.31
375.0	14.3	0.038	0.31 - 0.59
242.0	18.9	0.078	0.59 - 0.95
132.0	12.1	0.092	0.95 - 1.9
102.0	9.03	0.088	1.9 - 4.6
71.1	10.6	0.149	>4.6

^{1/} Measured at Blast Furnace Roof Opening. Location 19

(*Id.* at pdf p. 39.) As with the Glover smelter, the listed results begin with the backup filter (which collected the smallest sized particles), followed by Stage 5, Stage 4, Stage 3, Stage 2, and the finally Stage 1 (which collected the largest particles).

Dr. Libicki again provides the particle size distribution by both weight and percentage of the total at this location, showing—similar to the Glover results for the sinter building discussed above—that **95.5% of particulates from this fugitive source are smaller than 4.6 microns**. (Ex. K, Supplemental Libicki Report 3/19/2021, Table 7-2 at 30.) These findings, once again, directly refute Mr. Sullivan’s opinion that the vast majority of lead smelter fugitive emissions are larger than 10 microns. Instead, precisely the opposite is true.

3. Mr. Sullivan’s Reliance on the Small Subset of Microscopic Analysis Conducted on Ten of the Stage 1 Filters to the Exclusion of the Study’s Primary Data Is Scientifically Indefensible and Grossly Misleading

To better understand the sub-distribution of the largest particles captured by the cascade impactors on Stage 1 filters, the scientists in the *Two Lead Smelters Study* sent 10 of the Stage 1 filters to a separate laboratory for further microscopic analysis. (Ex. E, *Two Lead Smelters Study* at pdf p. 29.) Two of those Stage 1 filters—identified as filters #3004 and #3006—came from the Glover smelter at “the north end of the sinter building.” (*Id.*) The particle size distributions for these two Stage 1 filters are set forth in the unnumbered table below taken from the study:

Size (μ)	Number Percent		Calculated Weight Percent	
	3004 ^a /	3006 ^a /	3004 ^a /	3006 ^a /
< 5	83.1	52.5	7.2	1.2
5-10	12.5	31.7	16.9	11.3
10-15	2.4	9.1	14.9	15.0
15-20	1.3	4.4	22.4	19.7
20-25	0.5	0.9	18.2	8.7
25-30	0.1	0.8	6.7	14.1
30-40	0.1	0.4	13.7	14.5
40-50	-	0.2	-	15.5
50+				

^a/ Sample numbers.

(*Id.*)

In his Supplemental Report, Mr. Sullivan cites the data in this table in support of his opinion regarding the particle size distribution of total particulate fugitive emissions from the Complex's sinter building. (Ex. D, Supplemental Sullivan Report 5/28/2021, Table C-3 at 103 (citing "Ref. 115:29"—meaning page 29 of *Two Lead Smelters Study*—for the fugitive source "Sinter Building (Glover, Missouri)").) Mr. Sullivan contends that the last two columns of this table (calculated weight percent) indicate that the majority of emitted particulates from the sinter building are larger than 10 microns. The data reflected here, however, comes **only** from filters #3004 and #3006, **both of which are Stage 1 filters**, as the appendices to the study confirm. (Ex. E, *Two Lead Smelters Study* at pdf pp. 95, 101, 107, 114, & 121.) In other words, in his accounting of total particle size distribution, Mr. Sullivan has cherry-picked data and focused exclusively on the Stage 1 filters designed to capture **only the largest particulates**. By failing to include the other five filters, Mr. Sullivan has wholly disregarded roughly 95% of the total measured particulates from the sinter building, as discussed on pages 10-11 above (addressing Table 11 of the *Two Lead Smelters Study*).

The other eight Stage 1 filters sent for microscopic analysis came from the East Helena smelter. These Stage 1 filters were taken from locations in the sinter building, dross kettles, reverberatory furnace, blast furnace, and zinc furnace; they are specifically identified in the study as filters #3042, #3047, #3052, #3062, #3067, #3077, #3082, and #3087. (*Id.* at pdf p. 38.) Further

details regarding these filters are set forth in the appendices to the study, which consistently and repeatedly specify that all eight are Stage 1 filters. (*Id.* at pdf pp. 95–126.) The unnumbered table below, excerpted from the study, provides the particle size distributions by weight percentage for the particulates captured on these Stage 1 filters. The added green boxes call attention to the specific results from these Stage 1 filters that Mr. Sullivan relies upon to calculate his total particle size distributions in Table C-2 of his Supplemental Report:

Particle-Size Distribution in Calculated Weight Percent								
Size (μ)	Sinter Building		Dross Kettles		Reverberatory Furnace		Blast Furnace	Zinc Furnace
	3042	3047	3082	3062	3067	3077	3087	3052
< 5	3.3	5.1	7.0	2.0	1.8	3.7	1.5	3.2
5-10	23.4	23.4	34.5	10.9	14.9	16.3	7.0	12.5
10-15	18.7	20.1	25.9	13.4	17.8	17.5	8.8	18.4
15-20	19.5	20.8	21.1	19.0	18.0	17.4	14.6	19.2
20-25	10.9	8.8	4.1	13.9	10.6	13.0	11.3	11.1
25-30	16.0	10.7	7.4	11.6	17.0	15.8	10.3	6.8
30-40	8.2	11.1	-	19.1	19.9	16.3	17.7	14.0
40-50	-	-	-	10.1	-	-	15.1	14.8
50+	-	-	-	-	-	-	13.7	-

(*Id.* at pdf p. 40.)⁷

Once again, this method for calculating total particle size distributions is wholly improper. The results reflected in this table all come from Stage 1 filters and, as above, excludes the backup filters as well as the Stage 2, Stage 3, Stage 4, and Stage 5 filters. There is no scientific basis for

⁷ For the two locations with a single Stage 1 filter (blast furnace and zinc furnace), Mr. Sullivan adds the first two rows together (< 5 and 5–10) and then uses that number—based solely on Stage 1 filter data—to define the full range of particle size distributions for similar sources at the Complex. For the blast furnace, for example, he contends that just 8.5% (1.5 + 7.0) of fugitive particulate emissions were 10 microns or smaller; for the zinc furnace, the figure is 15.7% (3.2 + 12.5). (Ex. D, Supplemental Sullivan Report 5/28/2021, Table C-2 at 100.) For the remaining locations with two Stage 1 filters, Mr. Sullivan combines the percentages for particles 10 microns and smaller, and then averages the two combined filter percentages. Using this method, he concludes that 27.6% of particulates from the Complex’s sinter building, 27.2% of particulates from the dross kettles, and 18.4% of particulates from the lead reverberatory furnace were 10 microns or smaller. (*Id.*) Again, his methodology is unreliable and irrelevant because he excludes the data from the Stage 2, Stage 3, Stage 4, Stage 5, and backup filters at these locations.

assuming that the results from Stage 1 filters designed to capture only the largest particulates can possibly represent the full range of results collected from the remaining filter stages, all of which are designed to capture smaller and smaller particles. (Ex. K, Supplemental Libicki Report 3/19/2021 at 29 (“Note that in this specific work, microscopic analysis was carried out *only* on the Stage 1 samples. The microscopic analysis was intended to complement the PSD [particle size distributions] measured using the multi-stage impactor and provide additional information on the size break down among large particles only.”).)

Without the full set of data from the remaining five filters—whether using the cascade impactor results alone or as supplemented by further microscopic examination—there is no valid scientific basis for Mr. Sullivan to prepare full-scale particle size distributions for fugitive sources at the Complex. Mr. Sullivan’s decision to cherry-pick a subset of incomplete data based on the collection of the largest particles, while excluding all other information from the study, renders his particle size distributions unreliable and irrelevant. *See, e.g., In re Mirena IUS Levonorgestrel-Related Prods. Liab. Litig. (No. II)*, 341 F. Supp. 3d 213, 242 (S.D.N.Y. 2018) (“Where an expert ignores evidence that is highly relevant to his conclusion, contrary to his own stated methodology, exclusion of the expert’s testimony is warranted.”), *aff’d*, 982 F.3d 113 (2d Cir. 2020); *Dwyer ex rel. Dwyer v. Sec’y of Health & Human Servs.*, No. 3-1202V, 2010 WL 892250, at *148 (Fed. Cl. Mar. 12, 2010) (“A scientist might well pick data from many different sources to serve as circumstantial evidence for a particular hypothesis, but a reliable expert would not ignore contrary data, misstate the findings of others, make sweeping statements without support, and cite papers that do not provide the support asserted.”).

Indeed, Mr. Sullivan’s misuse of the data is refuted by the *Two Lead Smelters Study* itself. While Mr. Sullivan uses the microscopy results from the Stage 1 filters at East Helena to justify

his contention that a mere 8.5% of fugitive emissions from the blast furnace are 10 microns or smaller, the study elsewhere demonstrates—based on the collective results from all six filters—that the vast majority of blast furnace emissions are much smaller than 10 microns. As discussed on pages 11-12 above, Figure 4 of the study, which is located on the page immediately preceding the table Mr. Sullivan so heavily relies upon, demonstrates that 95.5% of “total particulate” emissions as measured at the blast furnace roof opening are smaller than 4.6 microns. (Ex. E, *Two Lead Smelters Study* at pdf p. 39); Ex. K, Supplemental Libicki Report 3/19/2021, Table 7-2 at 30.) Mr. Sullivan, in short, has gotten his distributions backwards. Mr. Sullivan has no serious explanation for this glaring discrepancy.

At his deposition, Mr. Sullivan, in apparent recognition of his error, suggested that all the filters at a given sampling location—not merely the Stage 1 filters—must have been sent to for microscopic analysis. (Ex. L, Deposition of David Sullivan (“Sullivan Dep.”) 7/9/2021 at 143:4–45:25.) There is, however, no evidence to support this assertion, and the study itself expressly states to the contrary. The study specifies that only 10 filters were sent for microscopic analysis. (Ex. E, *Two Lead Smelters Study* at pdf pp. 29, 38.) The study further identifies those filters by unique reference numbers (*id.*), all of which are described, repeatedly, as Stage 1 filters (*id.* at pdf pp. 95–126). The study then provides calculated weight percentages for those specific Stage 1 filters—and only those Stage 1 filters—citing the unique reference numbers for each. (*Id.* at pdf pp. 29, 40.) Mr. Sullivan’s off-handed, self-serving, and unfounded speculation cannot change these undisputed facts. See *B.H. v. Gold Fields Mining Corp.*, No. 04-CV-0564, 2007 WL 188130, at *3 (N.D. Okla. Jan. 22, 2007) (excluding Mr. Sullivan’s prior testimony in a separate case, noting that “the Court would not be fulfilling its duty as gatekeeper if it permitted the introduction of novel scientific methodology based solely on the assurances of the expert himself”).

4. As a Result of his Glaring Misuse of the *Two Lead Smelters Study*, Mr. Sullivan Overestimates Fugitive Air Emissions from the Complex by More than a Factor of Six

Mr. Sullivan’s errors in calculating total particle size distributions for the Complex result in gross overestimates of fugitive emissions. The magnitude of these overestimates is set forth in Table 6-6 of Dr. Libicki’s Supplemental Expert Report. That table shows that Mr. Sullivan has exaggerated DRP’s fugitive estimates for sources in the lead and zinc circuits by more than a factor of 6, and for one source (the blast furnace) by nearly a factor of 12. (Ex. K, Supplemental Libicki Report 3/19/2021 at 20.)

Mr. Sullivan’s estimates—based on incomplete and unrepresentative data taken exclusively from Sample filters designed to capture the largest of particles—bear no relation to reality and thus are neither relevant nor scientifically reliable. *See Gen. Elec. Co. v. Joiner*, 522 U.S. 136, 146 (1997) (courts should exclude expert testimony where “there is simply too great an analytical gap between the data and the opinion proffered.”); *Bricklayers & Trowel Trades Int’l Pension Fund v. Credit Suisse Secs. (USA) L.L.C.*, 752 F.3d 82, 92 (1st Cir. 2014) (finding expert’s testimony unreliable because he relied on a limited set of data from certain selected days to support his opinion while ignoring a whole swath of data from other days); *Tyger Constr. Co. v. Pensacola Constr. Co.*, 29 F.3d 137, 144 (4th Cir. 1994) (“When the assumptions made by an expert are not based on fact, the expert’s testimony is likely to mislead a jury, and should be excluded by the district court.”); *EEOC v. Am. Nat’l Bank*, 652 F.2d 1176, 1195 (4th Cir. 1981) (holding expert’s opinion unreliable when it drew conclusions from only one of seven years of data); *EEOC v. Freeman*, 778 F.3d 463, 467 (4th Cir. 2015) (“The sheer number of mistakes and omissions in [the expert’s] analysis renders it ‘outside the range where experts might reasonably differ.’” (quoting *Kumho Tire Co.*, 526 U.S. at 153)); *see also id.* at 468–69 (Agee, J., concurring) (stating that experts cannot pick certain data points to rely on and ignore others).

Defendants therefore request that Mr. Sullivan be precluded from testifying at trial about his improperly inflated fugitive emissions inventory and that the Court exclude any work that relies on his irrelevant and unreliable inventory. *See In re Baycol Prod. Litig.*, 532 F. Supp. 2d at 1042 (“Failure to show the reliability of each step in an expert’s methodology is fatal under *Daubert*.”); *Amorgianos*, 303 F.3d at 267 (“[A]ny step that renders the analysis unreliable . . . renders the expert’s testimony inadmissible.” (citation omitted and emphasis removed)).

B. Mr. Sullivan’s Computer Air Modeling Results Are Insufficiently Accurate to Be Deemed Reliable and Relevant

Mr. Sullivan has conducted computer air quality modeling based on his own as well as other emissions inventories for the Complex. To the extent that his modeling incorporates the inflated fugitive emission estimates discussed above, his models must be excluded as they are based on irrelevant and unreliable data. But even aside from the foregoing problems, Mr. Sullivan’s air quality modeling should be excluded because it fails to correlate to measured ambient air concentrations.

Air modeling is a generally accepted methodology, but for an air model to be valid and reliable, its results must be reasonably comparable to actual air sampling results. When conducting air quality modeling, it is understood that there will be some degree of variability from air quality measurements as computer models typically do not replicate perfectly real-world conditions. The question is the permissible degree of variability for a particular model given the purpose for which it is being used. As one might expect, the parties have different views on the appropriate answer to this question. Even using the more forgiving criteria endorsed by Mr. Sullivan, however, his modeling results are insufficiently accurate to be deemed reliable and thus should be excluded.

In his initial report in this matter, Mr. Sullivan maintains that “a standard rule of thumb for expected model performance is $\sim \pm$ a factor of two.” (Ex. A, Initial Sullivan Report 2/17/2019 at

85 (citing Sullivan Ref. 152:17).) Mr. Sullivan acknowledges, however, that the permissible range of variability is narrowed somewhat where the comparison is based on non-concurrent modeling and monitoring results (for example, when a three-month modeling average for February, March, and April is compared to a non-concurrent period of measured data, such as September, October, and November). (Ex. D, Supplemental Sullivan Report 5/28/2021 at 20 (describing reliance on the “factor of two from the mean”); *see also* Ex. M, Sullivan Ref. 143, USEPA, *Revisions to the Guideline on Air quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter*, 82 Fed. Reg. 5182, 5209 (2017) (noting that the typical error range in estimated non-concurrent modeled concentrations is 10 to 40 percent).)

Critically, none of Mr. Sullivan’s air quality modeling results satisfy these criteria. Dr. Shahrokh Rouhani, Defendants’ expert statistician, conducted a comparison of Mr. Sullivan’s nonconcurrent modeled lead concentrations versus measured lead concentrations at various air monitoring stations around the Complex. (Ex. N, Supplemental Expert Dr. Shahrokh Rouhani (“Supplemental Rouhani Report”) 3/19/2021 at 8–10.) The results for lead are set forth in Table B-1 of Dr. Rouhani’s Supplemental Expert Report, with results highlighted in red outside Mr. Sullivan’s own range of acceptable variability:

Nonconcurrent Lead

Table B-1. Station-specific Comparison of Measured Three-month Annual Maximum Lead vs. Predicted Values for Sullivan Modeling Scenarios.
Highlighted Cells are $\pm 40\%$ Different than Measured Values.

Station	Measured	<u>Sullivan-Cheremisinoff</u>		<u>Sullivan-McVehil</u>		<u>Sullivan-Sullivan</u>	
		Predicted	% Difference*	Predicted	% Difference*	Predicted	% Difference*
INCA	1.27	1.02	-20%	0.64	-50%	1.23	-4%
HUAN	6.47	1.92	-70%	0.96	-85%	2.44	-62%
CASA	0.42	0.08	-82%	0.08	-82%	0.13	-69%
MARC	1.03	0.21	-79%	0.17	-83%	0.37	-64%
HUAR	0.77	0.08	-90%	0.08	-90%	0.18	-76%
SIND	2.09	5.08	144%	5.92	184%	4.48	115%
HUAY	0.45	0.10	-77%	0.10	-77%	0.18	-59%

* (Modeled – Measured)/Modeled

(*Id.* at 27.) As explained by Dr. Rouhani, “These results indicate that the vast majority of predicted values generated by Mr. Sullivan in his various modeling efforts—even using noncurrent comparisons—are outside of the USEPA’s 40% typical margin of error.” (*Id.* at 9.)

This is a critical error in this case. By under-predicting results at locations further away from the Complex, Mr. Sullivan significantly over-predicts concentrations at the Sindicato monitoring station (“SIND” in the table above) located in La Oroya nearest to the Complex, where many of the Plaintiffs lived and attended school. Indeed, Mr. Sullivan’s predictions for the Sindicato station in La Oroya are 115% to 184% higher—or more than double—the actual measured concentrations. As a result: “Mr. Sullivan’s models display systematic biases by overestimating concentrations at the Sindicato Station, while underestimating concentrations at all other stations. These results clearly demonstrate the unreliability of Mr. Sullivan’s model under any of his emission treatment scenarios.” (*Id.*)

Mr. Sullivan’s modeling results for arsenic and SO₂ are similarly flawed and unreliable. For arsenic, 13 of the 14 non-concurrent modeling results provided by Mr. Sullivan fail the $\pm 40\%$ test. (*Id.* Table B-2 at 27.) For SO₂, 15 of the 24 non-concurrent modeling results provided by Mr. Sullivan fail the $\pm 40\%$ test. (*Id.* Table B-3 at 28.)

In short, because Mr. Sullivan’s air quality modeling results do not fall within the standard margin of error for non-concurrent comparisons, his models should be excluded from this case as well as any testimony or other evidence that relies or otherwise depends on those models.

IV. CONCLUSION

For the foregoing reasons, Defendants respectfully request that the Court exclude or limit all evidence and testimony pertaining to or reliant upon (1) Mr. Sullivan’s fugitive emission inventory for lead, arsenic, and other particulates for the La Oroya Complex; and (2) Mr. Sullivan’s air quality modeling of emissions of lead, arsenic, and SO₂ from the La Oroya Complex.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on this 15th day of November, 2021, a true and correct copy of the foregoing was filed with the Clerk of the Court through the Court's CM/ECF system, which will affect service on all counsel of record by sending a Notice of Electronic Filing.

/s/ Geoffrey M. Drake